MINERSVILLE RESERVOIR

Introduction

Minersville Reservoir is a large reservoir in the desert west of Beaver and east of Minersville. It is one of the larger reservoirs in western Utah, and has a State Park providing aquatic recreational in an area where there are few such facilities. It impounds winter runoff from the Tushar Mountains for agricultural use in the Minersville area. It is also known as Rocky Ford Reservoir

Minersville Reservoir was created in 1914 by the construction of an earth-fill dam. The reservoir shoreline is private and public lands, but public access is unlimited.

Characteristics and Morphometry

Lake elevation (meters / feet)	1,677 / 5,503
Surface area (hectares / acres)	400.6 / 990
Watershed area (hectares / acres)	137,587 / 339,840
Volume (m^3 / acre-feet)	
capacity	32,687,800 / 26,500
conservation pool	2,467,000 / 2,000
Annual inflow (m^3 / acre-feet)	37,091,345 / 30,070
Retention time (years)	.88
Drawdown (m^3 / acre-feet)	14,216,109 / 11,525
Depth (meters / feet)	
maximum	13.4 / 44
mean	8.1 / 26.7
Length (km / miles)	5.4 / 3.4
Width (meters / feet)	1.15 / .7
Shoreline (km / miles)	1.28 / 7.9

Location

County	Beaver
Longitude / Latitude	112 48 48 / 38 14 08
USGS Maps	Minersville Reservoir, Adamsville
DeLorme's Utah Atlas & Gazetteer™	Page 26, B-1
Cataloging Unit	Beaver (16030007)

Current water use is for irrigation, and no changes are anticipated.

Recreation

Minersville Reservoir is 12 miles west of Beaver (I-15 Exit 109 or 112) on U-21. From Minersville, the reservoir is six miles east on U-21. Access to the north shore of the reservoir is a dirt road from Adamsville to its junction with U -

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21, the junction being 2 miles west of the dam and 3.5 miles east of Minersville.

The reservoir is used for fishing, swimming, boating, and waterskiing. Usage is fairly heavy in wet years, but light in dry years. Recreation is concentrated to the reservoir itself, as the surrounding area is low desert. Minersville State Park has a sanded beach, a concrete public boat ramp, a 29 unit campground, flush toilets, hot showers, and picnic areas. The reservoir has also proven to be a valuable and popular fishery, which is operated and maintained by the DWR, who own a 2,000 acre-feet. conservation pool. The State Park is located along the southeastern shore of the reservoir with associated boating, swimming, fishing, and waterskiing. There is a private campground in Beaver (see info box).

During recent years with the adoption of the reservoir as a "trophy fishery" there has been a substantial decline in recreational use at the State Park. The facilities at the park are some of the best in the State, but park staff are concerned with the decline.

Watershed Description

Minersville Reservoir is an impoundment of the Beaver River at the west end of Beaver Valley, where the river passes through a gap between the Black Mountains to the south and the Mineral Mountains to the north, flowing out into the eastern Escalante Desert. This area is a desert valley with desert mountains to the north, south and west. The area around the reservoir is arid and relatively flat.

The river originates in the Tushar Mountains, with elevations of over 12,000 feet, making them the third highest range in the state. The headwaters are in wide, glaciated valleys surrounded by jagged peaks. The mountains are richly forested. Numerous smaller rivers join the Beaver River as it flows down a long, deep, narrow canyon. The mountains are used for logging, grazing and recreation. Mount Holly Ski Resort is here, as well as several summer camps and resorts, such as Puffer Lake. The bulk of the range is owned by the USFS, but there are some private lands with summer home development interspersed. In recent years, many of these private lands have been sites of timber harvest. These timber harvests have presented some concerns with regards to erosion control. The mountains are known for fishing, hunting, hiking, and general scenic beauty. There are a number of points that provide vistas of natural beauty unsurpassed in the State.

The city of Beaver was built where the river flows out into the valley. The low elevation provides a long growing season and the river ensures a steady supply of water. From the city to the reservoir, the river flows across the valley, acquiring several major tributaries from the Tushars (South Creek, North Creek, and Indian Creek) and several ephemeral streams from the Mineral and Black Mountains.

The watershed high point, Delano Peak, is 3,709 m (12,167 ft) above sea level, thereby developing a complex slope of 5.2% to the reservoir. The inflows are the Beaver River, Indian Creek, and Chalk Hollow Creek. The outlet is the Beaver River. The average stream gradient above the reservoir is 4.6% (245 feet per mile). The gradient is much lower in Beaver Valley and much higher in the Tushars. There are many upstream reservoirs in the Tushars, which are used for fishing, irrigation water storage, and hydroelectric power. The river and other streams are usually completely dewatered in Beaver Valley, with agricultural return flows returning to Minersville Reservoir. There are a number of upstream lakes and reservoirs in the Tushars, including Little Creek Reservoir, Kents Lake, Anderson Meadows Reservoir, LaBaron Lake, Three Creeks Reservoir, and Puffer Lake.

The watershed is made up of foothills, terraces, alluvial fans, high mountains, desert mountains, mountain valleys and foothills. See Appendix III for soil composition data.

The vegetation communities consist of urban, cropland (irrigated and nonirrigated), sagebruch-grass, bitterbrush, pinyon-juniper, oak, maple, aspen, pine, spruce-fir, and alpine. The watershed receives 25 - 102 cm (10 - 40 inches) of precipitation annually. The frost-free season around the reservoir is 120 - 140 days per year.

According to the 1992 Upper Beaver River Watershed Project, the DWQ estimates that the watershed contains: 9,000 acres of irrigated pastureland, 13,000 acres of irrigated croplands, 9,000 acres of state woodland and grazing land, 142,000 acres of BLM grazing land, 3,200 acres of urban land, 121,000 acres of USFS multiple use land (including 1,280 acres of ski resort).

Limnological Assessment

The water quality of Minersville Reservoir is fair. It is considered to be hard with a hardness concentration value of approximately 170 mg/L (CaCO3). Those parameters that have exceeded State water quality standards for defined beneficial uses are phosphorus, dissolved oxygen and some heavy metals.

The average concentration of total phosphorus in the water column in 1989 and 1992 was 137 and 113 ug/L which exceeds the recommended pollution indicator for phosphorus of 25 ug/L. Peak phosphorus concentrations, at various stages in the water column have reached as high as 270 ug/L. Dissolved oxygen concentrations in the water column substantiate the fact that water quality impairments do exist. Concentrations periodically drop below the criteria established for a cold water fishery. These conditions could also be compounded under extended ice coverage or development of a thermocline if sufficient depths were allowed to develop. However as indicated in the 1992 profile, current conditions due not allow sufficient depth in the reservoir for stratification.

Limnological Data

Data averaged from STORET sites: 594011, 594012, 594013

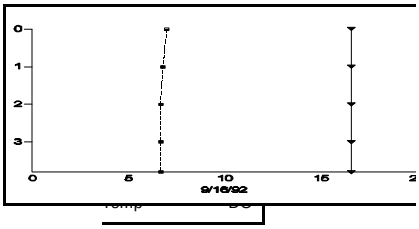
Surface Data	1980*	1989	1992
Trophic Status	E	E	E
Chlorophyll TSI	-	52.05	51.90
Secchi Depth TSI	46.796	51.96	46.34
Phosphorous TSI	72.255	75.90	69.56
Average TSI	59.52	59.97	55.94
Chlorophyll a (ug/L)	-	9.0	14.9
Transparency (m)	2.5	1.8	2.5
Total Phosphorous (ug/L)	110	146	113
pH	87.9	8.6	8.8
Total Susp. Solids (mg/L)	28	-	8.26
Total Volatile Solids (mg/L)	-	-	3
Total Residual Solids (mg/L)	-	-	6
Temperature (°C / °f)	17/63	19/66	18/65
Conductivity (umhos.cm)	414	560	599
Water Column Data			
Ammonia (mg/L)	0.09	0.01	0.03
Nitrate/Nitrite (mg/L)	.24	-	0.01
Hardness (mg/L)	150	-	189
Alkalinity (mg/L)	155	-	190
Silica (mg/L)	27.8	-	29.1
Total Phosphorous (ug/L)	107.5	137	113
Miscellaneous Data			
Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	8.7	6.8	6.6
Stratification (m)	NO	NO	NO
Depth at Deepest Site (m)	13	7.3	2.6

* Data from only 2 sites, 594011 and 594012

Some metal concentrations were found to exceed state standards during the Clean Lakes Phase I study period (1992). The standards used were based on a 200 mg/L total hardness concentration. The average cadmium concentration did not exceed the 4 day standard of 2.0 ug/L, but a maximum value of 4.0 was reported. The average concentration for lead of 10.4 ug/L exceeded the 4 day standard of 7.7 ug/L. An average value of 0.19 ug/L was reported for mercury which has a 4 day standard of 0.12 ug/L. Finally silver had a reported mean value of 3.29 ug/L with a 4 day standard established at 0.12 ug/L. It should be noted that although violations of the standard for cadmium, lead, mercury and silver were observed, some clarifications of the data need to be presented. The data obtained was from samples near the bottom of the reservoir only. This is an area where higher concentrations are found due to the decomposition and resuspension of metals. Historical data throughout the water column has not show any significant elevated concentrations of metals. For a more complete discussion of these violations refer to the Minersville Reservoir Clean Lakes Phase I Study (1995).

Minersville Reservoir is a eutrophic reservoir that is subject to considerable variation in excessive algae growth, turbid waters, heavy water plant growth at times, low dissolved oxygen concentrations and occasional fish kills. As a result a Clean Lakes study was undertaken on the reservoir in 1991. The intent of that study was to quantify nutrient loadings to the reservoir and determine what alternatives were available to reduce or eliminate nutrient loadings into the reservoir. Although data suggest that the reservoir is a nitrogen limited system, targeted nutrients included nitrogen and phosphorus. Those sources identified as most like controllable were farm and ranch operations. TSI values indicate the reservoir is eutrophic. It does appear that there has been a significant reduction in the loadings to the reservoir in recent years. In 1975 EPA NES survey the reservoir was characterized as hypereutrophic. Since that time nutrient loadings from the following sources have been eliminated or diverted to a nondischarging lagoon system: Beaver Fish Hatchery; Cache Valley Creamery; Valley Packing Company and Beaver City sewage.

According to DWR no fish kills have been reported in recent years. However, during the late summer of 1994,



there was a documented fish fill at the reservoir. A review of the data indicates that it was probably due to a combination of factors; a heavy blue-green algal bloom (*Anabaena spiroides var. crassa*), high temperatures, and low dissolved oxygen. The reservoir supports populations of rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarki*), Utah chub (*Gila atraria*), and smallmouth bass (*Micropterus dolomieui*). In addition brown trout (*Salmo trutta*), which are planted annually in the drainage above the reservoir may be in the reservoir. Over the years Minersville Reservoir has provided an exceptional trout fishery. Repeated chemical treatments (1958, 1961, 1967, 1972, 1977, 1984, and 1991) have failed to completely eradicate the competing chub populations. Since these treatments have not been able to effectively control the populations of these rough fish a study was done to determine and formulate a new management program. As a result the basic management concept at the reservoir has been changed from a "Basic Yield Water" to a "Trophy Water"

To accomplish their goals after the last treatment the reservoir was stocked with 7-inch rainbow and cutthroat trout instead of the customary 3-inch trout. Stocking was done in June when most of the predacious birds had migrated north which would allow the fish to reach approximately 15 inches by the following March when the bird populations peak. In addition smallmouth bass were planted to provide more fishing variety and biological control of chubs. Finally, special fishing regulations are used to reduce harvest and maintain a large population of trout in the reservoir. The currently reported fish population (trout) has attained the size necessary to be harvested under existing regulations.

Reported types of plankton present historically in the reservoir include *Daphnia spp.*, *Ceratium sp.*, *Fragillaria sp.*, and *Nostoc sp.*. The Daphnia occurring in the reservoir is the larger type, and serves as the main food source. Plankton is abundant in the reservoir. The bottom fauna is reported to be relatively sparse except for *Chironomidae*. Phytoplankton present in the euphotic zone by sampling period include the following taxa (in order of dominance):

Samples from October 1, 1991.

Species	Cell Volume (mm^3/liter)	% Density By Volume
Ukn. fil. green algae	6.539	51.11
Melosira granulata	2.556	19.99
Pediastrum duplex	1.334	10.44
Pennate diatoms	0.937	7.33
Stephanodiscus niagarae		0.352
2.75		
Anabaena spp.	0.278	2.17
Closteriopsis long. v. tropica	0.296	2.30
Coelastrum microporum	0.215	1.68
Oscillatoria spp.	0.072	0.56
Chlorococcum spp.	0.056	0.43
Meloisra. granulata angustissima	0.050	0.39
Centric diatoms	0.044	0.35
Ankistrodesmus falcatus		0.034
0.27		
Oscillatoria amphibia	0.014	0.11
Scenedesmus bijuga	0.008	0.06
Total		
Shannon-Weaver Index[b]	1.55	
Species Evenness	0.57	
Species Richness[d]	0.62	

Samples from August 13, 1992.

Species	Cell Volume (mm^3\Liter)	% Density by volume
Stephanodiscus niagarae		7.294
53.36		
Sphaerocystis schroeteri		2.641
19.32		
Melosira granulata	1.745	12.75
Staurastrum gracile	0.723	5.29
Centric diatoms	0.420	3.07
Pennate diatoms	0.362	2.65
Fragilaria crotonensis	0.229	1.68
Oscillatoria spp.	0.091	0.67
Euglena spp.	0.066	0.60
Asterionella formosa	0.066	0.48
Oocystis spp.	0.017	0.12
Totals		
Shannon-Weaver Index[b]	1.41	
Species Evenness	0.60	
Species Richness[d]	0.44	

Samples from August 17, 1994.

Species	Cell Volume (mm^3\Liter)	% Density by volume
Anabaena spiroides var. crassa	96.13	378.69
Pleromonas spp.	1.85	7.28
Trachellomnonas spp.	1.84	7.25
Sphaerocystis schroeteri		0.16

0.61		
Dysmorphococcus spp.	0.01	0.04
Unknown sperical chlorophyta	0.01	0.03
Ankistrodesmus falcatus		0. 0 0
0.02		
Oocystis spp.	0.00	0.01
Chlamydomonas spp.	0.00	0.00
Totals	100.00	393.93
Shannon-Weaver Index[c]	0.21	
Species Evenness	0.09	
Species Richness[d]	0.30	

The phytoplankton community dominance changes according to existing water quality conditions. However, the most recent community is dominated by the presence of noxious blue-green algae, *Anabaena*. This composition is indicative of relatively poor water quality, and highly eutrophic conditions.

Pollution Assessment

Nonpoint sources of pollution in Minersville Reservoir include: sedimentation, and nutrient loading from grazing in the watershed and in the vicinity of the reservoir, pesticides and fertilizers from cultivated cropland, human wastes and litter from recreation, and urban runoff. These sources currently exhibit a significant impact on reservoir water quality.

Beneficial Use Classification

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), warm water game fish and organisms in their food chain (3B), wildfowl and associated organisms (3D), and agricultural uses (4).